We claim:

1. An apparatus, comprising:

a stent; and

means for enhancing microwave radiation that is scattered from said stent, wherein said means produces a larger scattered microwave radiation field over that which would occur from said stent absent said means.

2. The apparatus of claim 1, wherein said means comprises a cylindrical symmetry variation in said stent.

3. The apparatus of claim 1, wherein said stent comprises a cylindrical axis, wherein said means comprises a gap along said cylindrical axis.

4. The apparatus of claim 1, further comprising a microwave transmitter for transmitting microwave radiation to said stent, wherein said stent produces scattered or reflected microwave radiation.

5. The apparatus of claim 4, further comprising a microwave receiver for receiving data comprising said scattered or reflected microwave radiation.

6. The apparatus of claim 5, further comprising computer hardware with software comprising an algorithm for analyzing said data to determine whether in-stent restenosis has occurred.

7. The apparatus of claim 6, wherein said software further comprises an algorithm for analyzing said data to quantify the amount of in-stent restenosis that has occurred.

8. The apparatus of claim 3, further comprising dielectric material within said gap.

9. The apparatus of claim 3, wherein said stent comprises a stent cavity, said apparatus further comprising an electric shield to block electronic field penetration into said stent cavity.

10. The apparatus of claim 1, wherein said means comprises a dimension that is tuned to maximize the detection of in-stent restenosis.

11. The apparatus of claim 1, wherein said means comprises a dimension that is tuned for at least one microwave frequency.

12. The apparatus of claim 3, wherein said gap comprises a dimension that is tuned for at least one desired frequency.

13. The apparatus of claim 1, wherein said stent comprises a compact state with a first cross-sectional area and an expanded state with a second cross-sectional area that is greater than said first cross-sectional area.

14. The apparatus of claim 1, wherein said stent is selected from the group consisting of a cardiovascular stent, a neurovascular stent and a urological stent.

15. The apparatus of claim 6, further comprising an alarm, wherein said algorithm triggers said alarm if in-stent restenosis is present.

16. The apparatus of claim 7, further comprising an alarm, wherein said algorithm triggers said alarm if in-stent restenosis exceeds a pre-set level.

17. The apparatus of claim 7, further comprising an alarm, said apparatus further comprising a wireless transmitter operatively connected to said computer hardware, wherein said algorithm notifies a selected contact if in-stent restenosis exceeds a pre-set level.

18. An apparatus, comprising:

a stent; and

a microwave transmitter or microwave receiver operatively connected to said stent, wherein said microwave transmitter is configured for transmitting microwave radiation to said stent to produce scattered microwave radiation, and wherein said microwave receiver is configured for receiving data comprising microwave radiation scattered from said stent.

19. The apparatus of claim 18, further comprising computer hardware with software comprising an algorithm programmed to perform a task selected from the group consisting of (i) analyzing said data to determine whether in-stent restenosis has occurred and (ii) analyzing said data to quantify the amount of in-stent restenosis that has occurred.

20. The apparatus of claim 18, further comprising means for enhancing microwave radiation that is scattered or reflected from said stent, wherein said means produces a larger scattered or reflected microwave radiation field over that which would occur from said stent absent said means.

21. The apparatus of claim 20, wherein said means comprises a cylindrical symmetry variation in said stent.

22. The apparatus of claim 18, wherein said stent comprises a cylindrical axis, wherein said means comprises a gap along said cylindrical axis.

23. The apparatus of claim 22, further comprising dielectric material within said gap.

24. The apparatus of claim 20, wherein said stent comprises a stent cavity, said apparatus further comprising an electric shield to block electronic field penetration into said stent cavity.

25. The apparatus of claim 20, wherein said means comprises a dimension that is tuned to maximize the detection of in-stent restenosis.

26. The apparatus of claim 20, wherein said means comprises a dimension that is tuned for at least one microwave frequency.

27. The apparatus of claim 22, wherein said gap comprises a dimension that is tuned for at least one desired frequency.

28. The apparatus of claim 18, wherein said stent comprises a compact state with a first cross-sectional area and an expanded state with a second cross-sectional area that is greater than said first cross-sectional area.

29. The apparatus of claim 18, wherein said stent is selected from the group consisting of a cardiovascular stent, a neurovascular stent and a urological stent.

30. The apparatus of claim 19, further comprising an alarm, wherein said algorithm triggers said alarm if in-stent restenosis is present.

31. The apparatus of claim 19, further comprising an alarm, wherein said algorithm triggers said alarm if in-stent restenosis exceeds a pre-set level.

32. The apparatus of claim 19, further comprising an alarm, said apparatus further comprising a wireless transmitter operatively connected to said computer hardware, wherein said algorithm notifies a selected contact if in-stent restenosis exceeds a pre-set level.

33. An apparatus, comprising:

a computer readable medium; and

computer software programmed onto said computer readable medium, wherein said software comprises an algorithm programmed to perform a task selected from the group consisting of (i) analyzing data to determine whether in-stent restenosis has occurred and (ii) analyzing data to quantify the amount of in-stent restenosis that has occurred.

34. The apparatus of claim 33, wherein said algorithm is programmed to perform the task of analyzing data to determine whether in-stent restenosis has occurred, said algorithm comprises the steps of:

analyzing measurement of scattered signal as a function of microwave frequency to identify peaks; and

comparing peaks to previously measured baseline when no restenosis had occurred, wherein if the shifts in the peak locations exceed a predefined maximum then in-stent restenosis has occurred.

35. The apparatus of claim 33, wherein when said algorithm is programmed to perform the task of analyzing data to quantify the amount of in-stent restenosis that has occurred

36. A method for detecting in-stent restenosis in a patient that has an implanted stent, comprising:

probing said stent with microwave radiation to produce reflected or scattered microwave radiation;

detecting and collecting said reflected or scattered microwave radiation to produce data; and

analyzing said data to determine whether in-stent restenosis has occurred.

37. A method for quantifying the amount of in-stent restenosis that has occurred in a stent implanted in a patient, comprising:

probing said stent with microwave radiation to produce reflected or scattered microwave radiation;

detecting and collecting said reflected or scattered microwave radiation to produce data; and

analyzing said data to quantify the amount of in-stent restenosis that has occurred in said stent.

38. The method of claim 37, wherein the microwave transmitter and receiver have a fixed relative position.

39. The method of claim 37, further comprising optimizing the signal levels of said reflected or scattered microwave radiation by moving at least one of a microwave transmitter or a receiver.

40. The method of claim 37, wherein said microwave radiation comprises less than 200 MHz to excite acoustic oscillations in said stent, wherein the step of detecting is carried out with an ultrasound transducer placed in contact with the skin to detect acoustic oscillations.

41. The method of claim 40, further comprising pulsing said radiation and wherein said step of detecting includes time gated ultrasound detection to increase signal to noise.

42. A method for preparing a patient for detection of in-stent restenosis, comprising implanting a stent within a patient, wherein said stent

comprises means for enhancing microwave radiation that is scattered reflected from said stent, wherein said means produces a larger scattered or reflected microwave radiation field over that which would occur from said stent absent said means.

43. The apparatus of claim 3, further comprising a microwave diode within said gap.

44. The apparatus of claim 5, wherein said microwave transmitter and said microwave receiver operate over a frequency range of 0.1 to 50 GHz.

45. The apparatus of claim 5, wherein said microwave transmitter and said microwave receiver are polarization sensitive.